

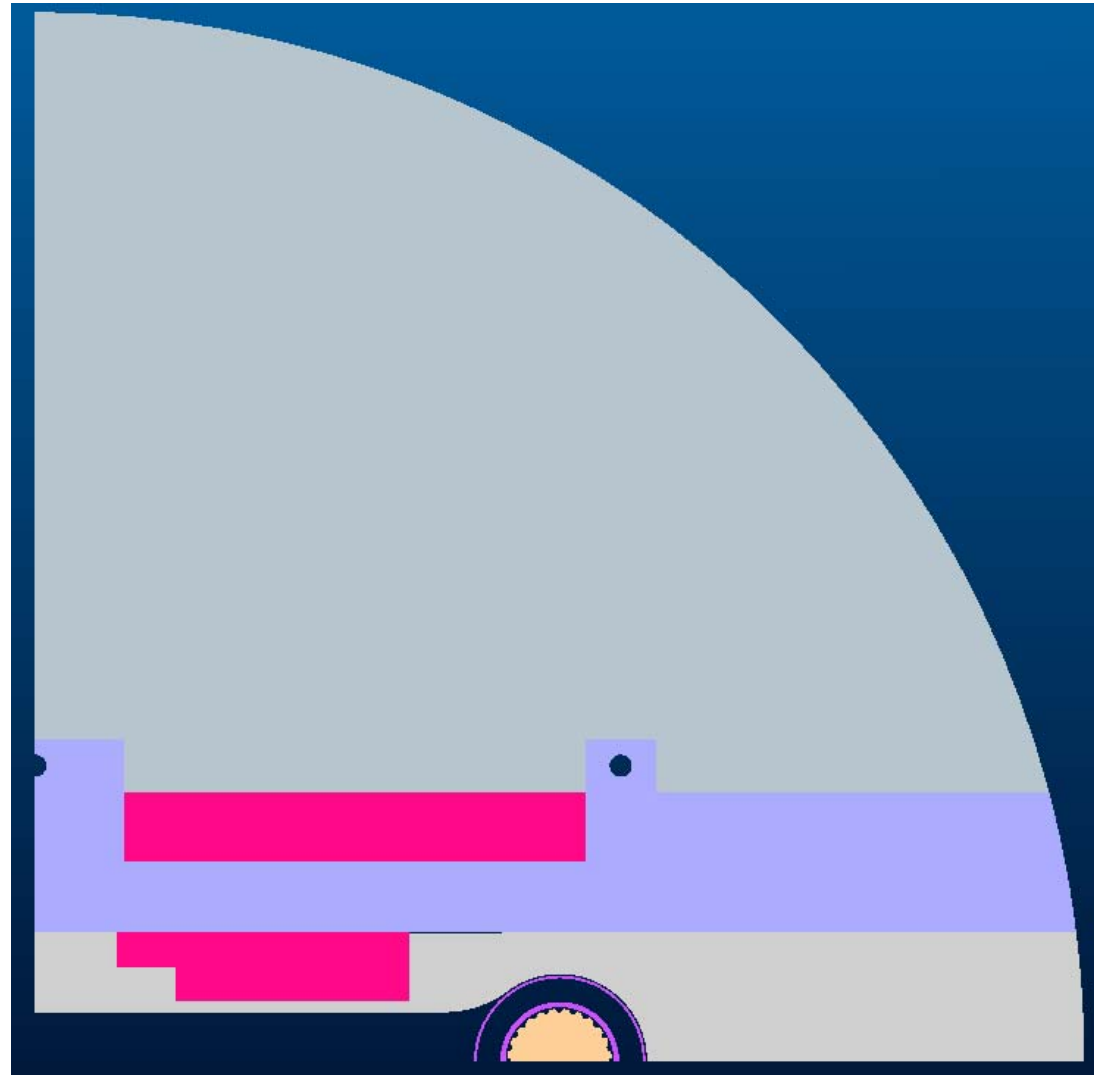
LARP Dipole - Mechanical Analysis

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LARP Dipole - Assembly Overview

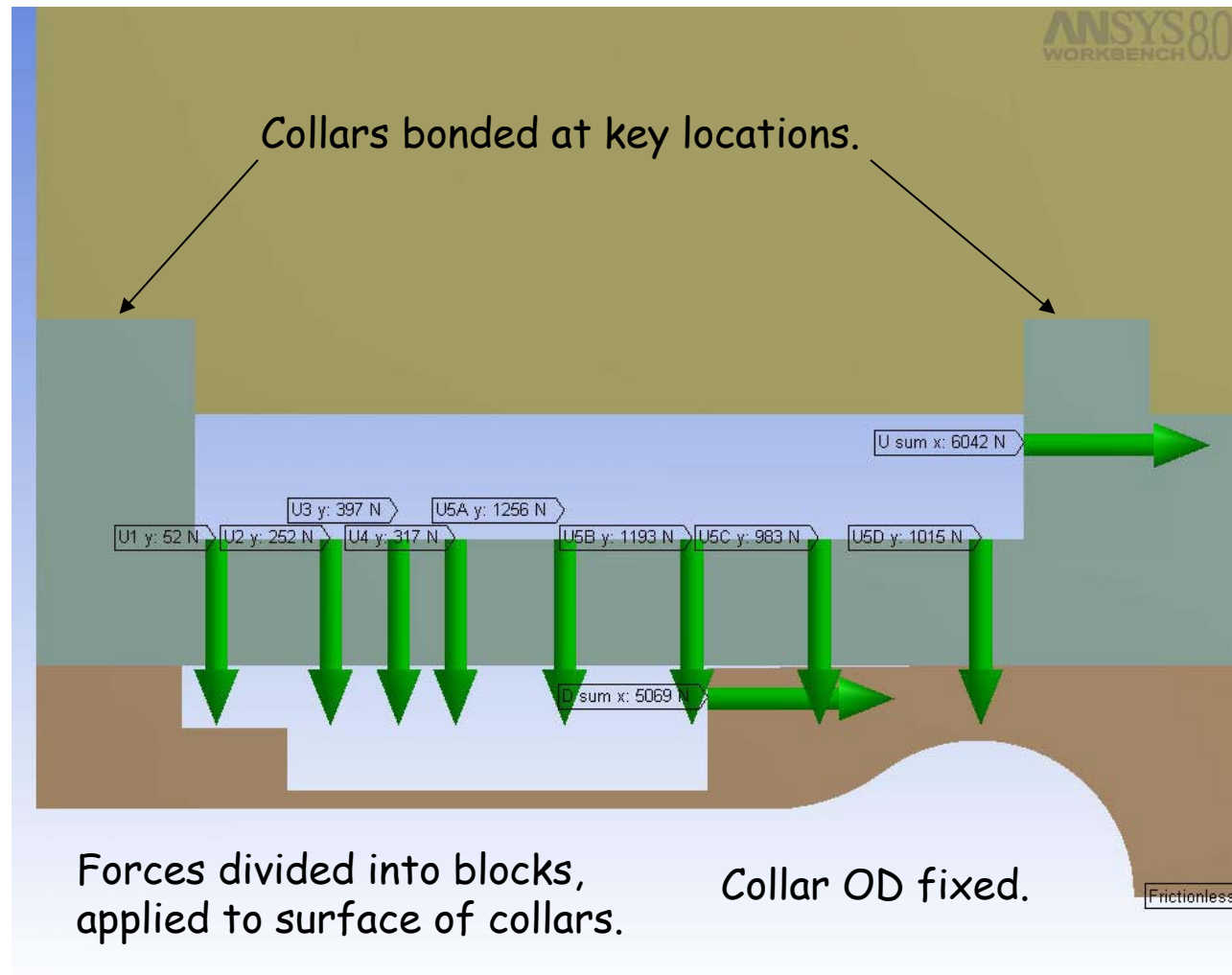
- Outer coil supported by stainless steel collar laminations spot welded into pairs.
- Collars joined with key rods where collars interlock.
- Inner coil support is solid stainless steel machined part.
- No separate beam cavity, inner coil support acts as vacuum enclosure.
- Pre-load applied to coils.



Mechanical Analysis - Forces, Constraints

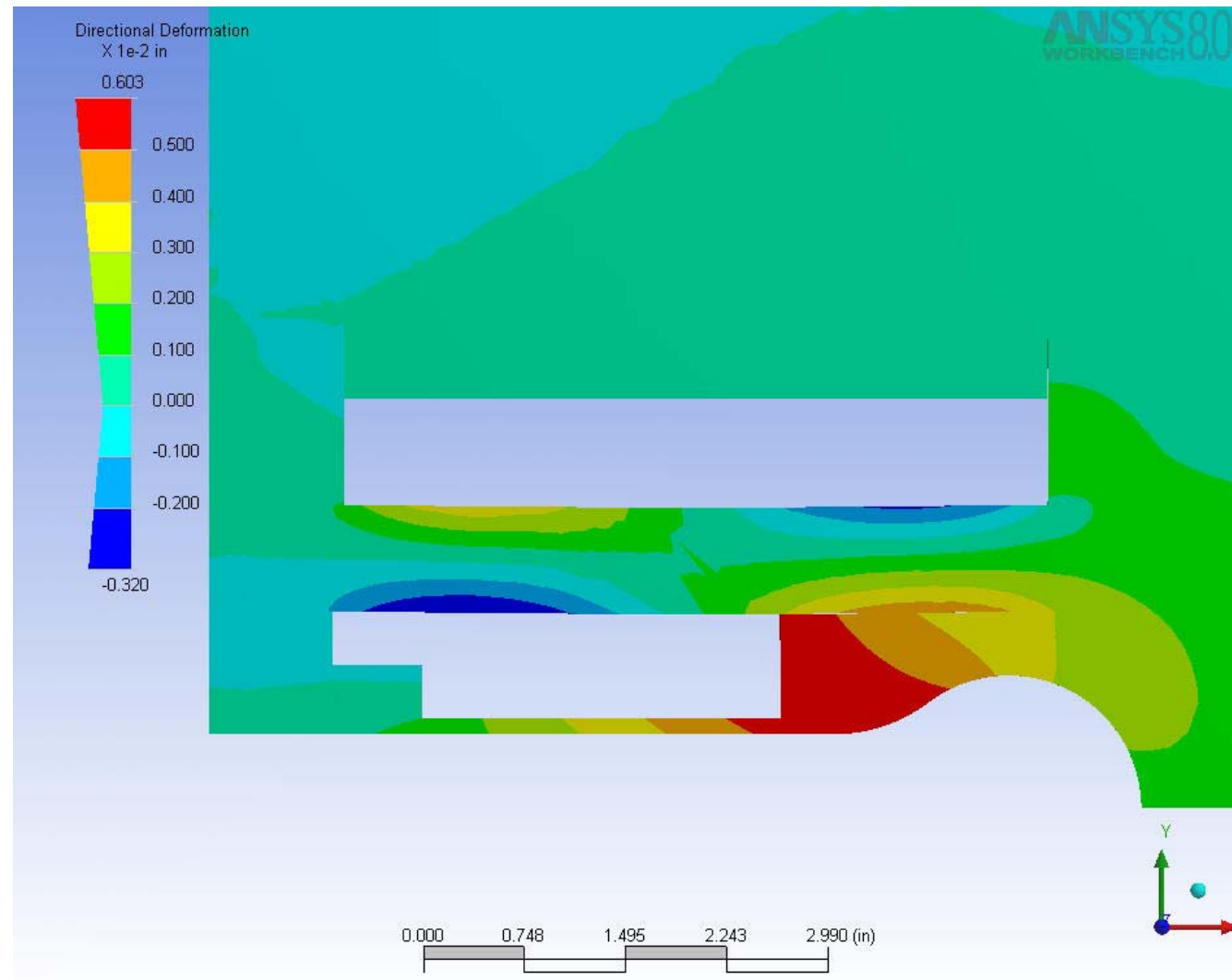
Coil Forces N/mm		
Block	X	Y
Inner Coil		
D1	74	-2
D2	1205	-11
D3	963	-7
D4	2827	87
Sum D	5069	67
Outer Coil		
U1	392	-52
U2	1138	-252
U3	1238	-397
U4	892	-317
U5A	2043	-1256
U5B	1037	-1193
U5C	249	-983
U5D	-947	-1015
Sum U	6042	-5465

Net vertical force on inner coil is upward.



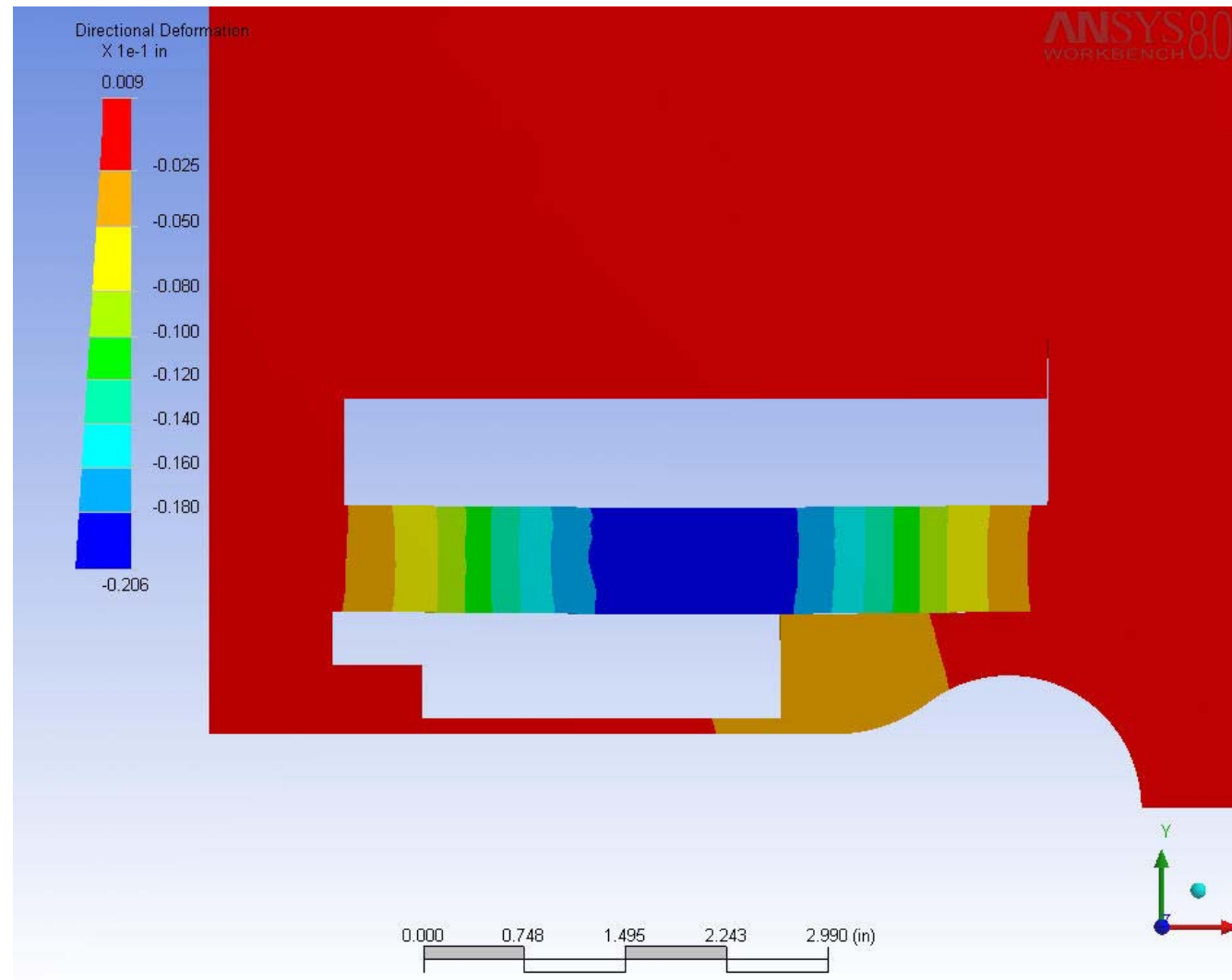
Mechanical Analysis - Deflection X

- Relative deflection less than .001" on vertical surfaces
- Max total deflection is .006"
- Preload to be applied in horizontal direction via wedges installed at the coil pole.



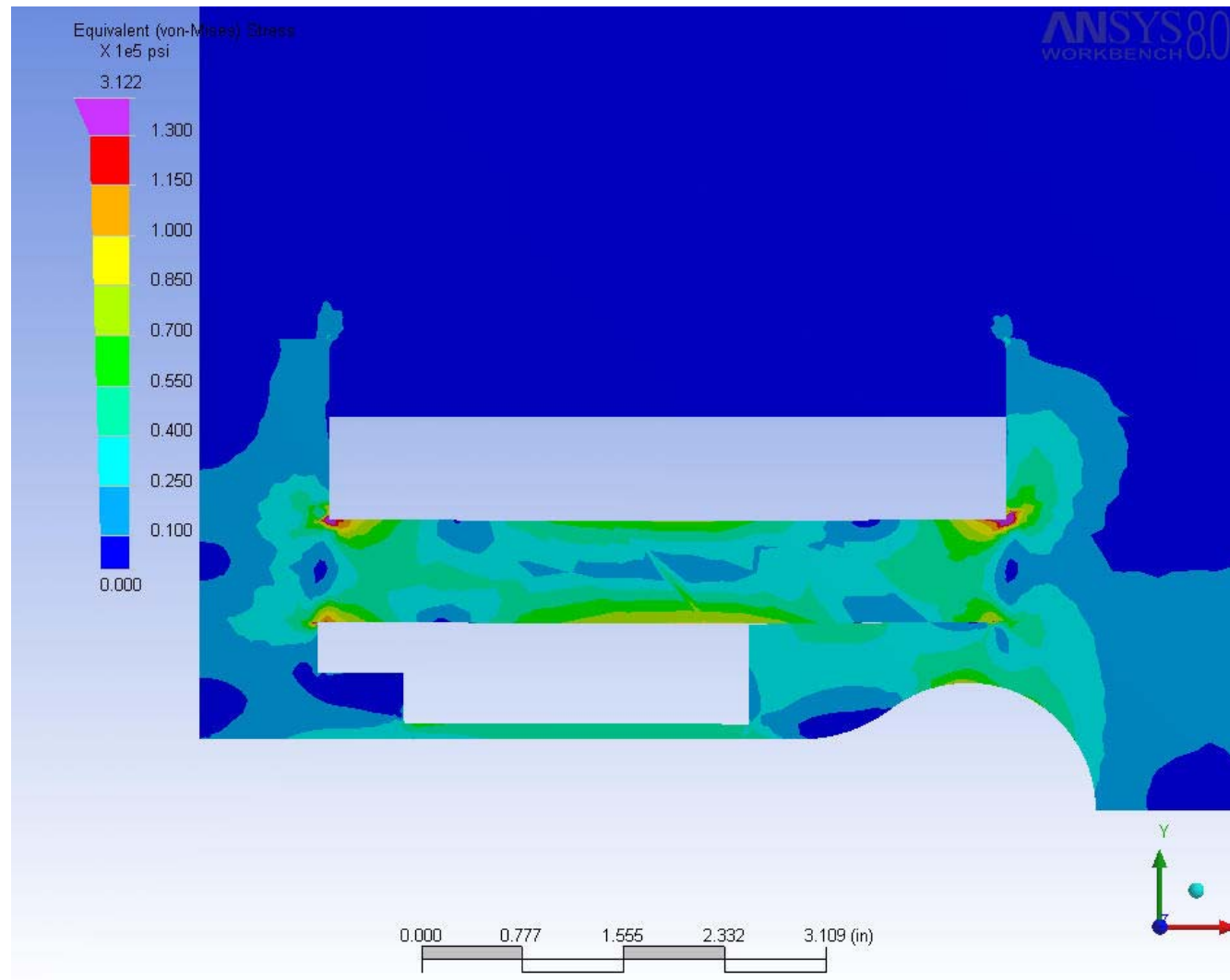
Mechanical Analysis - Deflection Y

- .020" max deflection
- Preload to be applied in vertical direction via pressing operation. Collar curved to start in order to achieve a flat coil at operating field.



Mechanical Analysis - Stress

- Stress in the main support web are below 80 kpsi
- Peak stresses are in the corners.



LARP Dipole - Conclusions / Issues

- Conclusions
 - Mechanical structure is within acceptable stress limits at operating field.
 - Deflections have been minimized by design and procedure.
- Issues
 - Level of pre-load required in X & Y directions.
 - Experiments with LBNL subscale coils.
- Next Step
 - Develop 3D design.